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Block for Forming wall and the wall thus formed

Technical field

This invention relates to a block for forming constructing walls and constructing roofs, as well as walls thus formed. In particular, it relates to a block capable of forming the walls, which are double-side leak-proof and water-stop.

Background art

The measures for realizing leak proof, non watertight and soil keeping of the wall are important problems in the field of construction.

The leaking portions are: 1) leakage of the masonry joint of the wall, 2) leakage between the masonry block and the frame pillar in the construction of framework, 3) leakage between the masonry block and the top surface of frame girder in the construction of framework, 4) leakage between the masonry block and the bottom surface of frame girder in the construction of framework.

There are two ways for realizing leak proof of the masonry joints in walls. One is to reduce the craze of the masonry joint. The other one is to adopt a design of a concave-convex structure, which makes the masonry block leak-proof by the mutually bonding of the blocks. However, there are some disadvantages, such as complicated production, inconvenience of use, shortcoming of functions and so on, thus not solving the existing problem.

As shown in figure 1, CN00103227. 5 discloses a "masonry block of dry brick". Claim 1 thereof defines that "a block for forming a wall by engaging with other blocks, comprising a top surface having a ridge thereon, a bottom surface having a slot for engaging with the ridge, a front surface and a rear surface of platforms. There are notches at the ends to make a lap joint". On page 3 of the specification, it is shown in detail that "the ridge 3 preferably has a front slope portion 6 and a rear slope portion 26, the front slope portion 6 and the back slope portion 26 make the water entering the space between two bricks discharge from the space between the blocks". The part between the blocks is a horizontal masonry joint, the slightly projected ridge

of this block has the function of leak proof. As defined in claim 1, the ridge, the slot and the notches of the block take the functions of "inlay" and "lap joint", however, they do not solve the leak proof of the vertical masonry joints in different weather environments. The slightly projected ridge of this block has a limited function of leak proof. Just like the assembled block of CN86106157 and the hollow block of CN03218670.3, it is valueless for a general leak proof of the wall.

As shown in figure 2, CN96194387.4 discloses "a block for forming the dry-masonry wall". It merely has the function of one-side leak proof, suitable for the dry masonry or laid-dry method and unsuitable for the sticking masonry. And, the dry masonry thus formed is not suitable for the main wall, since it has a bad lateral stability. It is inconvenient to fire this block in the form of bar. If the small ridges and slots are changed into a horizontal plane to make the sticking masonry convenient, then the block will lose the function of mutual engagement, and thus making the lateral instability more easy. When constructed with stones and bricks by mortar, the extending ply of the mortar on drainage bevel surface of every block is inconsistent. If the extending ply of the mortar is regulated by applying force vertically onto the drainage bevel surface, the wall has the possibility of lateral instability. However, if the extending ply of the mortar is not regulated, the surface of the wall will not be smooth because of the uneven projection of the block.

In the past, the solutions for solving leaking problem of the joint between the masonry block and the frame pillar are mainly that: providing tension reinforcing steel bar and pouring-punning them into linked girder to strengthen the joint and reduce the craze. However, this can not solve the problems of craze and leak proof.

There is no way for leak proof between the masonry block and the upper, bottom surfaces of the frame girder yet.

To realize leak proof of the wall of underground constructions, it commonly adopts the sealing cincture, waterproof ointment and some other water-proof materials to make the constructive slots and distortional slots air-proof and leak-proof. However, the sealing cincture and waterproof ointment are prone to be aged. There is another leak-proof measure, i.e., providing a sweat-soldering leak-proof layer between the wall and the rock, however, this measure usually results in leakage because of the loose engagement of the jointing, drop of the jointing, or craze of the leak-proof layer due to a distortion of the building.

The problem of the "non watertight" and "soil keeping" of retaining walls, dikes, embankments and other constructions are two inter-restrictions. The existing technologies are mainly to set up some drainage holes on the wall or to adopt dry masonry, neither of which can synchronously drain the water and protect the soil ideally.

Summary of the invention

In order to solve the existing problems, this invention provides the solutions as follows.

A block for forming a wall, wherein a plurality of analogous blocks are overlapped staggeringly and continuously in the wall. The block is a longitudinally profiled member, and includes a top surface, a bottom surface and two end surfaces. The cross section of the block is substantially of a shape of downward-flared recess. The top surface of said block has a mid ridge higher than two sides of the surface so that a left supporting slope and a right supporting slope are formed. The upper surface and bottom surface are formed such that: when the block is overlapped with a analogous block thereunder to form the wall, the top surface of the underlying block is engaged with the bottom surface of the upper block. The left and right supporting slopes are used as a blocking structure and make the vertically adjacent blocks to be interlocked

The "longitudinally profiled member" does not mean a completely uniform geometrical cross section. On the contrary, it means a structure, which mainly features in the left and right supporting slopes. For example, the block can include tongued-and-grooved structure on two end surfaces, or can have a hole inside the block. All of these can be considered as a longitudinally profiled member having the same cross section.

The "the cross section of the block being substantially of a shape of downward-flared recess" means such a feature that: the block has a small top and a large bottom; the projecting size of the mid ridge is large enough to cut off a space-time trajectory; the downward-flared recess for masonry engagement is deep correspondingly. For example, no matter with or without the shoulder, it is still within the concept of "the cross section of the shape of downward-flared recess". The space-time trajectory can be obtained based on the given standards on leak proof or non watertight and soil keeping. The projecting size of the mid ridge can be

determined according to the calculated space-time trajectory. The leak proof or non watertight and soil keeping standards can be established by the weather, experience and requirements in every country and every quarter.

In this invention, said "mid ridge" does not mean an exact geometrically middle or central portion. Any ridge, so long as it can form the left and right supporting slopes, can be considered as the mid ridge. For example, the ridge of the block, which has a shoulder on one side or has different supporting slopes on both sides, also belong to the mid ridge.

The left and right supporting slopes are used as a blocking structure. It shall be emphasized that it is a blocking structure capable of being leak-proof or non-watertight and soil-keeping.

The "being engaged with" means that the blocks are sized and shaped such that they can form the wall by dry masonry, sticking masonry, dry hanging and other masonry constructions. For example, the engagement between the adjacent blocks, or between the block and the auxiliary block, or between the block and the relevant member in the wall can be used to form the wall. The sticking masonry means a masonry by using cement and mortar, mixed mortar, chemical glue, adhesives and other bonding materials. The dry masonry and dry hanging do not adopt the bonding materials.

The blocks are shaped and sized such that: when three analogous blocks are overlapped vertically, the vertical distance between the top of the ridge of the bottommost block and the bottom foot of the uppermost block is less than one third of the height of the block. With the wall formed by the shaped and sized blocks, when the water moves in the air while being subject to the force, which is equal to the 7th levels wind and is vertical to the wall, the projecting size of the mid ridge can cut off the space-time trajectory, and hence to be leak-proof.

The blocks are shaped and sized such that: when the three analogous blocks are overlapped vertically, the top of the ridge of the bottommost block is higher than the bottom foot of the uppermost block. The leak-proof or non-watertight and soil-keeping effects are the most perfect.

The "bottom foot" means the lowest portion of both sides, the sides are bounded by the mid ridge, of the block. When the lowest portion is a plane, the bottom foot is

the portion which is most close to the surface of the wall to be formed.

The top surface has a radiation-proof plate thereon, which extends out of the end surface. The blocks are shaped and sized such that: when the three analogous blocks are overlapped vertically, the top of the ridge of the bottommost block is higher than the bottom foot of the uppermost block. In the wall formed by the blocks, the radiation-proof plate of adjacent blocks are connected end to end , and thus having the effect of radiation protection.

A block assembly for forming a wall comprises blocks and auxiliary blocks. A block for forming a wall, wherein a plurality of analogous blocks are overlapped staggeringly and continuously in the wall. The block is a longitudinally profiled member, and includes a top surface, a bottom surface and two end surfaces. The cross section of the block is substantially of a shape of downward-flared recess. The top surface of said block has a mid ridge higher than two sides of the surface so that a left supporting slope and a right supporting slope are formed. The upper surface and bottom surface are formed such that: when the block is overlapped with a analogous block thereunder to form the wall, the top surface of the underlying block is engaged with the bottom surface of the upper block. The left and right supporting slopes are used as a blocking structure and interlock the vertically adjacent blocks. In said wall, masonry joints are formed between the adjacent blocks, horizontal masonry joints are formed by the engagement between the top surfaces and the bottom surfaces, vertical masonry joints are formed by the engagement between the end surfaces, the vertically adjacent vertical masonry joints are arranged staggeringly. The staggering arrangement makes the blocks to be interlocked with each other to form a stable wall. The vertical masonry joints are also capable of producing the leak-proof effect and the non-watertight and soil-keeping effect.

When a pillar is provided in the wall, an outward-extending piece is provided on the side surface of the pillar. The outward-extending piece is engaged with the blocks, thus avoiding the leakage at the joint between the block and the pillar, and making the block to be engaged with the pillar and to be firmly interlocked.

When a girder is provided in the wall, a projecting piece is provided on the top surface of the girder, a groove is provided on the bottom surface of the girder. The lower surface of the projecting piece is engaged with the top surface of the girder. The projecting piece extends to the pillar at the nodal point of two adjacent beam/pillar,

and engages with the pillar. The projecting piece is engaged with the downward-flared recess of the block, when the block engages with the top surface of the girder. The groove extends to the pillar at the nodal point of two adjacent beam/pillar, the groove is engaged with the top surface of the block, when the block engages with the bottom surface of the girder.

The projecting piece can stop the leakage at the joint between the block and the top surface of the girder. The groove can stop the leakage at the joint between the block and the bottom surface of the girder. The projection and the groove make the engagement between the block and the girder tight, and make the interlock stable.

For non-watertight and soil-keeping purpose, a non-watertight channel can be provided in the masonry joint of the wall. The water can run through the channel from one side of the wall to the other side. When the masonry joints is in dry masonry, the non-watertight channel is larger, and thus better non-watertight effect can be produced.

An isolation layer is provided on one side of the wall. The isolation layer is composed of several isolation sub-layers. The isolation sub-layers in the same layer are arranged in a manner of end to end. The isolation sub-layers in vertically layers are in lap joint. The lower isolation sub-layer is interposed between the upper sub-layer and the wall. The joint between the upper isolation sub-layers is staggered with that between the lower isolation sub-layer. An air gap is formed between the isolation layer and the wall.

A miter wall is formed by staggeringly overlapping elongated blocks. A vertical masonry joint is formed by the connection of the end surfaces of two blocks. The vertically adjacent vertical masonry joints are disposed in a stagger manner. The end of the elongated block is supported on a supporting member.

This invention solves the leak-proof problem and the non-watertight and soil-keeping problem by offering and analyzing a space-time trajectory of the fourth dimension.

Theoretical model of leak proof is that: when the water on the surface of the wall flows into the horizontal masonry joint and then into the vertical masonry joint, or directly into the vertical masonry joint, it flows inwardly and downwardly into the wall under the gravity and wind pressure, its space-time trajectory of leakage follows

the rule of "high to low". At this time, the top of the vertical masonry joint (slot) on the wall (i.e., the bottom foot of the block on the top of the vertical masonry joint) is usually the vertex of the space-time trajectory of leakage. The supporting slopes are provided on the block, the left and right supporting slopes form the mid ridge. When the water flows along the space-time trajectory to the ridge of the block under the vertical masonry joint, the top of the mid ridge can cut off the space-time trajectory to realize leak proof. Obviously, the larger the size of the ridge is, the better of the leak-proof effect is.

As known to all, the faster the muddy water is, the fewer the sediments are; the slower the muddy water is, the more the sediments are. The space-time trajectory of the muddy water follows the rule of "high to low". The non-watertight and soil-keeping theoretical model is that: the supporting slope are provided on the block, the left and right supporting slopes form the mid ridge; the top of the ridge can cut off the space-time trajectory of the muddy water to make the water flowing into the horizontal masonry joints and the vertical masonry joints can only overflow the ridge of the block; the soil in the water is blocked by the supporting slope; the larger the mid ridge is, the better the non-watertight and soil-keeping effect is.

The block, which complies with this theoretical model, is a longitudinally profiled member. It shall have a top surface, a bottom surface and two end surfaces. The cross section of the block shall be in a shape of down-flared recess. The top surface of the block has a mid ridge higher than two sides of the surface so that the left and right supporting slopes are formed. The top and bottom surfaces are formed such that: when the block is overlapped with a analogous block thereunder to form the walls, the top surface of the underlying block is engaged with the bottom surface of the upper block. The left and right supporting slopes are used as a blocking structure and interlock the vertically adjacent blocks. The projecting size of the mid ridge can cut off the space-time trajectory.

When the standards for leak proof or non watertight and soil keeping are determined, the space-time trajectory can be determined, and then the projecting size of the mid ridge, which cuts off the space-time trajectory, can be determined. The larger the ridge is, the better the blocking effect is, and the better the water-stop, leak-proof or the non-watertight and soil-keeping effects are. The ideal leak-proof and non-watertight and soil-keeping effects are: the blocks are shaped and sized such that: when three analogous blocks are overlapped vertically, the top of the ridge of the

bottommost block is higher than the bottom foot of the uppermost block.

According to theoretical model of leak proof, it takes a simple mathematical model 1 as an example. Suppose that the direction of the wind is horizontal and vertical to the surface of the wall, raindrops flow from the bottom foot, which is the topmost point of the vertical masonry joint, into the vertical masonry joint and flow inwardly and downwardly in the air. Suppose the bottom foot is the topmost point of the space-time trajectory of the leakage, the horizontal distance and the vertical distance from the bottom foot to the peak of the ridge of the lower block are Sx and Sy, respectively. The horizontal movement of the raindrops is an uniform motion, the horizontal speed is Vx, the time for the horizontal displacement Sx is Tx, then Sx=Vx*Tx. The ultimate speed of vertical descent of the raindrop is Vy=9m/s, the time for the vertical displacement Sy is Ty, that is Sy=9Ty. Suppose the width of the block is 20 cm, when the peak of the sharp-angled ridge is in the middle of the width of the block, Sx=10cm, Tx=10/Vx. If the ridge of the block can cut off the space-time trajectory of leakage to be leak-proof, then it is necessary Tx>Ty. In this case, for ease of calculation, the horizontal speed of Vx is equal to the speed of the wind. In the above conditions, critical Sy in different pressure of wind is in the following table 1, the vertical distance necessary for leak proof shall be less than the Sy as in the table.

Table. 1

Wind force(grade)	Speed of the wind Vx (m/s)	Vertical distance Sy (cm)
7	16	5. 6
8	19	4. 7
9	23	3. 9
10	26	3. 5
11	31	2. 9
12		

No matter how complicated the actual leakage is, the smaller the Sy is, the larger

the size of the ridge of the block into the downward-flared recess is, and the better the leak-proof effect is. It can be concluded from table 1 that: when $Sy<0$, that is, when three analogous blocks are overlapped vertically, it is preferable that the ridge of the uppermost block be higher than the bottom foot of the lowermost block. At this time, the effect of leak proof is the best.

Although the weather over the world are different, only if the mathematical model of the leak proof or the non-watertight and soil-keeping is established, and the standards of design of the leak proof or the non-watertight and soil-keeping is given, the relevant size of the block, which meet the requirements, can be determined.

The purposes and the helpful effects of this invention are mainly the following.

It perfectly solves the leak-proof problem of the masonry joints, and the problem of non-watertight and soil-keeping. It uses elongated blocks to form a leak-proof roof. It solves the leak-proof problem at the joint between the block and the pillar by the outward-extending piece. It solves the leak-proof problem at the joint between the block and the top surface of the girder by the projecting piece. It solves the leak-proof problem at the joint between the block and the bottom surface of the girder by the groove. It solves the leak-proof problem or the non-watertight and soil-keeping problem.

The block is of simpleness, few specifications, and is easy to be manufactured, transported and piled.

The block can be of different sizes, long or short, deep or thin, large or small.

The block can adopt different materials to manufacture, such as silt, clay, concrete, shale, haydite, plastic, resin, mental, composite material and other constructional materials, or coal ash and coal slag, coal slack, smelting slag, mineral slag, waste mineral, straw, rubbish and other waste materials. The materials can be acquired handily, thus saving the cost, making the wastes into use, protecting the environment.

The block can be used by sticking masonry, dry masonry, dry hanging and other ways of masonry.

The formed wall can be used widely, such as for house construction, tunnel, underground, wave wall, mine, underground structure and other constructions, or for

retaining wall, embankment, road embankment, potamic-and-sea coast, barging bank, earth-rock dam, protective slope, sand dam, underground collecting reservoir and sewage disposal building, coffer for field and so on. It can be used for constructing the radiation-proof walls, for constructing the leak-proof roof, for constructing the structural layer of the bridge, for constructing the ground, and for constructing other constructions or structures.

The formed wall has the advantages in earthquake resistance, antidumping, entirety and stability.

<u>Description of figures</u>

Figure 1 is a view of the block of dry brick of CN00103227. 5 in the prior art.

Figure 2 is a perspective view of the block for forming dry wall construction of CN96194387. 4 in the prior art.

Figures 3, 4, 5 and 6 are four views of the block of the invention.

Figures 7, 8, and 9 are three perspective views, in which the block has a mid ridge of a platform shape.

Figures 10, 11, and 12 are three perspective views, in which the block has the mid ridge of an arc shape.

Figures 13 is a perspective view, in which the lateral sides of the block is beveled.

Figure 14 is a perspective view, in which the bottom surfaces of the block at both sides are not of the same height.

Figure 15 is a perspective view, in which the block has planar edges.

Figure 16 is an explanatory view of a structure having three blocks with the supporting slopes arranged in a stepped manner.

Figure 17 is an explanatory view of a structure having three blocks with the supporting slopes and the bottom surfaces arranged in a stepped manner.

Figure 18 is a perspective view of a block with the supporting slopes arranged in

an arc-stepped manner.

Figure 19 is a perspective view of a block with the supporting slopes and the bottom surfaces arranged in an arc-stepped manner.

Figures 20-23 are four perspective views, in which the blocks are of corrugated shape.

Figure 26 a perspective view, in which a slope of the block has a longitudinal groove.

Figures 27, 28 are perspective views of blocks with roughness of stripe shape.

Figures 29 is a perspective view of block with roughness of dot shape.

Figures 30, 31 are perspective views of blocks with flow-guiding projections.

Figures 32, 33 are perspective views of blocks having radiation-proof plate on the top thereof.

Figures 34-38 are perspective views of blocks with holes.

Figures 39-42 are perspective views of blocks with notches.

Figure 43 is a perspective view of a structure having blocks with secondary shoulders.

Figures 44, 45 are perspective views of blocks with a heat-insulating layer.

Figure 46 is a perspective view of a block with a decorative surface.

Figure 47 is a perspective view of a block with sound-absorbing openings and notches.

Figure 48 is a perspective view of a block of an arc shape in the longitudinal direction.

Figure 49 is a perspective view of a block of a ball-and-crown shape.

Figures 50-55 are explanatory views of structures, in which the blocks are engaged with six kinds of auxiliary blocks, respectively.

Figures 56, 57 are two perspective views, in which the auxiliary blocks are cross-shaped.

Figures 58, 59 are two perspective views of L-shaped auxiliary blocks.

Figures 60, 61 are two perspective views of T-shaped auxiliary blocks.

Figures 62, 63 are two explanatory views of structures constructed by the blocks of the present invention.

Figure 64 is a sectional view of the wall of Figure 62.

Figure 65 is a sectional view of a wall having the girders.

Figure 66 is an explanatory view of a wall formed of the blocks of this invention, which wall is subjected to a lateral force.

Figure 67 is a sectional view of the wall formed of the blocks of this invention, which is shown in figure 5.

Figures 68, 69 are sectional views of the walls having connecting members.

Figure 70 is a perspective view of a block, which is formed by combining a thin plate with shoulders.

Figures 71, 72 are two perspective views of molding blocks.

Figure 73 is a perspective view of a wall for vertical planting.

Figures 74, 75 are sectional views of walls having radiation-proof materials.

Figure 76 is a perspective view of a wall, which is anti-cracking.

Figure 77 is a partially enlarged view of a part of a slot as shown in figure 76, mortar is used in the construction.

Figure 78 is a perspective view of a wall, which is formed by an elongated block and a pillar with projections.

Figure 79 is an explanatory view of a wall of a tunnel.

Figure 80 is an explanatory view of an insulation-protection layer.

Figure 81 is an explanatory view of a wall having an air layer.

Figures 82-90 are explanatory views of nine kinds of walls.

Figures 91, 92 are perspective views of two elongated-shaped blocks.

Figure 93 is a perspective view of a block, which is engaged with the block as shown in figure 92.

Figure 94 is a longitudinally sectional view of the block as shown in figure 93.

Figure 95 is a perspective view of a miter wall.

Figure 96 is a perspective view of a structure of a roof of a house formed by the invented blocks.

Figure 97 is an explanatory view of a structure of a ridge of a house formed by the invented blocks.

Figure 98 is an explanatory view of a structure of a deck of a bridge formed by the invented blocks.

Figure 99 is an explanatory view of a structure on the ground formed by the invented blocks.

Figure 100 is a view of a mold for producing a semi-finished product of a bar shape.

Figure 101 is a perspective view of an imprinting wheel of an imprinting device as shown in figure 100.

Figures 102, 103 are views of two box-type molds.

Embodiments

The following are the further descriptions of the invention with reference to the figures. However, the figures, the ways described and the technical parameters cannot be understood as limitations to the present invention.

Figure 3 and 4 show the basic structural of the block of the invention. The block is a longitudinally formed (longitudinal profiled) product. The cross section of the

block is of a downward-flared shape, and includes a top surface 1, a bottom surface 2 and two end surfaces 3. The top surface has a mid ridge 4 higher than the two sides of the surface so that a left supporting slope 5 and a right supporting slope 6 are formed. Both the top of the mid ridge and the bottom surface are of sharp-angled shape. As shown in figure 3, the planes at two sides of the bottom surface of the block are horizontal planes. Two bottom feet 6 are at the intersections between the top surface and the bottom surface. The block of figure 4 has a lateral connecting surface 7, the bottom feet 6 thereof are at the intersections between the lateral connecting surface and the bottom surface.

The shape of the block shown in figure 5 is based on the shape shown in figure 4. It has a shoulder 8 on one side. The shoulder 8 includes a top shoulder surface 9, a bottom shoulder surface 10, and a lateral side surface 11. The top shoulder surface one side of the block, the upper slope 12, the mid ridge and the supporting slope on the other side constitute the top surface. When being constructed, the projecting portion formed by the two slopes 12 on both sides of the mid ridge will engage with the downward-flared recess at the bottom surface of another block. One of the bottom feet is at the intersection between the lateral connecting surface and the bottom surface, the other one is at the intersection between the lateral side surface and the bottom surface.

The shape of the block shown in figure 6 is based on the shape shown in figure 4. It has shoulders 8 on two sides. In other words, the shape of the block of figure 6 is based on the shape shown in figure 5, with another shoulder on the other side. The top shoulder surface, the slopes 12 and the mid ridge constitute the top surface. The bottom shoulder surface is horizontal, the bottom foot is at the intersection between the lateral side surface and the bottom surface. The bottom shoulder surface and the bottom foot on one side is at the same plane. The two end surfaces are parallel to each other, and the two lateral side surfaces are parallel to each other. The end surfaces and the lateral side surfaces are vertical to the horizontal plane. This type of block is commonly used for forming vertical walls.

The sizes and the shapes of the shoulders on both sides can be different to each other. The shoulder is suitable to bear loads or weights.

The shapes of the tops of the mid ridges and the tops of the bottom surfaces of the blocks shown in figure7, 8 and 9 are all in the shape of a platform.

The shapes of the tops of the mid ridges and the tops of the bottom surfaces of the blocks shown in figure 10, 11 and 12 are all in the shape of an arc shape.

The sharp angle of the mid ridge is prone to be broken. If the top of the ridge is in the shape of the platform, arc-shape, or the like, the mid ridge is not prone to be broken and suitable to bear the loads.

The sharp-angled bottom foot of the block is prone to be broken. If the bottom foot of the block shown in figure 4 is changed into horizontal planes and the bottommost part of the engaged top surface is changed into horizontal planes correspondingly, then it will obtain the blocks shown in figure 5 and 6.

The "bottom foot" means the bottommost parts on both sides, which is bounded by the mid ridge, of the block. The bottom foot on one side of the block is the bottommost part of that side. When the bottommost part is a surface, the bottom foot is positioned at the intersection between the bottommost surface and the top surface or the lateral connecting surface or the lateral side surface.

The block shown in figure 13 is based on the block shown in figure 6. The lateral side surfaces are two inclined surfaces, which are parallel to each other and not vertical to the horizontal plane. The shape of the block shown in figure 14 is based on the shape shown in figure 9, the lateral side surfaces of the shoulder on both sides are parallel to each other and vertical to the horizontal plane. However, the bottom foot on both sides are not at the same plane. The wall, which is formed by the blocks having the different height of the bottom foot on both sides, can take different functions. The variations of the lateral side surfaces and the lateral connecting surfaces make the wall have variable appearances.

In the block shown in figure 15, at the joints between the top shoulder surface, bottom shoulder surface and the lateral side surface, planar edges 13 are formed. The top shoulder surface and the bottom shoulder surface are inclined, in particular, the part is becoming lower as approaching to the lateral side surface, and thus facilitating the drainage. Since the block forming the wall has the planar edges, it will facilitate the plaster and slip, if the wall is whitewashed. The block with the planar edges is decorative. The lateral side surfaces of the adjacent blocks of the wall is probably not at the same plane because of the misalignment of the block. The planar edges can lighten the feeling of misalignment.

In the block shown in figure 16, the supporting slopes are arranged in a stepped manner. In the block shown in figure 17, the supporting slopes and the bottom surfaces are arranged in a stepped manner.

In the block shown in figure 18, the supporting slopes are arranged in an arc-stepped manner. The block shown in figure 19 is based on the block in figure 18, both the supporting slope and the bottom surface of the block shown in figure 19 are arranged in an arc-stepped manner.

At least one of the supporting slope or the bottom surface of the block is arranged in the stepped manner. For example, the supporting slope is arranged in the stepped manner; or the bottom surface is arranged in the stepped manner; or both the supporting slope and the bottom surface are arranged in the stepped manner. In particular, the upper slope of the top surface is arranged in the stepped manner. The stepped arrangement facilitates the supporting slope bearing the loads.

The blocks shown in figure 20-26 have corrugated or tooth-stepped shape. The supporting slope of the block shown in figure 20 has the corrugated or tooth-stepped shape. The upper slope of the block shown in figure 21 has the corrugated or tooth-stepped shape. The block shown in figure 22 is based on the block in figure 20, the bottom surface of the block has the corrugated or tooth-stepped shape. The block shown in figure 23 is based on the block in figure 21, the downward-flared recess on the bottom surface also has the corrugated or tooth-stepped shape. The slope of the block shown in figure 24 has the arc-corrugated shape. The block shown in figure 25 is based on the block in figure 24, the downward-flared recess on the bottom surface also has the arc-corrugated shape. The upper slope of the block shown in figure 26 has a longitudinal groove.

At least one of the supporting slope and the downward-downward-flared recess of the block is arranged in the corrugated shape. For example, the supporting slope is in the corrugated shape; or the downward-flared recess is in the corrugated shape; or both the supporting slope and the downward-flared recess are in the corrugated shape. In particular, the upper slope of the top surface is arranged in the corrugated shape. The shape of corrugation facilitates the slip or drainage by forming air gaps.

The blocks shown in figure 27, 28 have anti-crack roughness of a stripe shape. The block shown in figure 27 has the lateral roughness of the strip shape on its upper

shoulder surface and bottom shoulder surface. The block shown in figure 28 is based on the block in figure 27, the lateral roughness of the strip shape does not reach the lateral side surface. The blocks shown in figure 29 have the anti-crack roughness of a dot shape.

At least one of the top surface and the bottom surface of the block is in the shape of roughness. In particular, the top shoulder surface and the bottom shoulder surface are in the shape of roughness. The purpose of providing the roughness shape is to make the surface of the construction rough and to improve the resistance of longitudinal motion of the vertically adjacent blocks, thus increasing the capability against cracking. The modes of the roughness shape are various. The roughness shape facilitates the slip (slurry retaining).

The variation of the surface of the block is not limited to the shapes of corrugation and roughness, it can be other shapes. In order not to affect the drainage, in particular, shapes resulting in water accumulation can not be provided on the supporting slope of the block. In the case of dry masonry, the block, which has smooth slopes and downward-flared recess with the corrugated shape, is better, since the slope and downward-flared recess has fewer connecting joints and larger space therebetween, it will make the drainage easy.

At the end of the slope of the block shown in figure 30, vertical flow-guiding projections 14, capable of preventing the water from flowing to the end surface, are provided.

The slope of the block shown in figure 31 has a plurality of vertical flow-guiding projections 14, capable of obtaining a better effect of water blocking.

The blocks shown in figure 32 and 33 are radiation-proof blocks, which have radiation-proof plates 15 extending out of the end surface. This block is used for forming a radiation-proof wall. The block shown in figure 32 has the radiation-proof plate on the top surface. The block shown in figure 33 has the radiation-proof plate on a supporting slope on one side.

The blocks shown in figure 34, 35, 36, 37 and 38 have various holes 16. The block shown in figure 34 has large vertical holes in single-row on both sides. The block shown in figure 35 has the vertical holes in dual-row on one side. The block shown in figure 36 has small vertical holes on one side. The block shown in figure 37

has large longitudinal holes on both sides. The block shown in figure 38 has some small longitudinal holes.

The amount and the shape of the holes can be various. The holes can be provided on either or both sides of the block, can be one or more, can be through-holes or blind-holes. The functions of the holes are to reduce the weight, fill the heat-insulated materials or the concrete. The through-hole is also used for the passage of the pipeline. The vertical hole is also used for the insertion of the reinforcing steel bar, which forms the core wall of the concrete.

The blocks shown in figure 39, 40, 41 and 42 have the various notches 17.

The block shown in figure 39 has an inward-concave notch on one end surface and an outward-convex notch corresponding thereto. The vertical notch of the end surface can extend the horizontal route of the leakage, thus facilitate the leak proof. The engagement between the end notches on the end surfaces of the adjacent blocks will facilitate interlock therebetween.

The block shown in figure 40 has a longitudinal notch on its upper shoulder surface.

The block shown in figure 41 has notches on its upper shoulder surface and two end surfaces.

The block shown in figure 42 has a horizontal notch at one end through the shoulder and the downward-flared recess of the bottom surface.

The amount and shape of the notches are not limited to the illustrated types. The notches can be used for arranging the pipeline; for mounting connecting member or grid mesh; or for making the block and the frame construction to be connected firmly.

The block shown in figure 43 is based on the block shown in figure 6. On the lateral side of the shoulder, a secondary shoulder 18 is provided. The top shoulder surface of the secondary shoulder 18 is lower than that of the shoulder 8, the bottom shoulder surface of the secondary shoulder 18 and that of the shoulder 8 shoulder are at the same surface. The secondary shoulder and the shoulder of the block take a decorative effect at the masonry joints. The bottom shoulder surface of the secondary shoulder can be lower than that of the shoulder. The secondary shoulder can be provided on either or both sides. The secondary shoulder can be more than one, be of

different height, width or length. Also, the secondary shoulder can be provided with holes or notches.

The blocks shown in figure 44 and 45 have a heat-insulating layer 19. The block shown in figure 44 has the heat-insulating layer on the shoulder on one side. The shoulder on one side of the block shown in figure 45 connects to the sandwich-type heat-insulating layer by a dovetail engagement. The other side of the sandwich-type heat-insulating layer is usually connected with a decorative or protective surface. The heat-insulating layer can be a plate, such as a polyphenylene plate or the like, which have the function of heat insulation. The heat-insulating layer and the decorative or protective surface connected therewith can be considered as the secondary shoulder.

The block shown in figure 46 has a decorative surface 20 on the lateral side surface. The decorative surface is usually provided at the lateral connecting surface, or the lateral side surface of the block. Various colors and the designs of the decorative surface can be selected.

The block shown in figure 47 has a structure for absorbing sound or noise. On one side of the block, a sound-absorbing hole 21 and a notch 22 are provided. The sound-absorbing notch is on the lateral side surface of the block. The inner wall of the sound-absorbing hole shall be designed such that the sound can be damped by being reflected repeatedly. The sound-absorbing notches shall allow more sound to enter into the sound-absorbing hole. The amount of the sound-absorbing hole and the sound-absorbing notch can be changed as required.

The block shown in figure 48 is of an arc shape in the longitudinal direction. The lateral side surface thereof is an arc surface around a vertical axis of the block. The block, as a whole, is of the arc shape in the longitudinal direction from one end surface to the other end surface. This kind of block is usually used in the construction of arc-shaped wall. The block shown in figure 49 is based on the block shown in figure 48. The block shown in figure 49 is of a ball-and-crown shape. It is of a vertical arc shape from the bottom surface to the top surface, and the lateral side surface is of a vertical arc-shape. Thus, the whole shape is of a ball-and-crown shape. This kind of block is usually used in the walls of the sky dome, spherical surface and the hyperboloidal surface.

The blocks shown in figures 3-49 are all longitudinally profiled blocks. The

blocks have the top surface, bottom surface and two end surfaces. The cross section of the block is substantially of a shape of downward-flared recess. The top surface has the mid ridge higher than the two sides of the surface so that the left supporting slope and the right supporting slope are formed. The top surface and the bottom surface are formed such that when the block is overlapped with a analogous block thereunder to form the wall, the top surface of the underlying block is engaged with the bottom surface of the upper block, and hence the left and right supporting slopes are used as a blocking or stopping structure and make the vertically adjacent blocks to be interlocked. The projecting size of the mid ridge can cut off the space-time trajectory, and the downward-flared recess has the corresponding size. If the projecting size of the mid ridge is larger, then the downward-flared recess is larger, and the effect is better. When three analogous blocks are overlapped vertically, it is most preferable that the top of the ridge of the bottommost block be higher than the bottom foot of the uppermost block.

Figures 50-55 show the engagement of the blocks with some auxiliary blocks. Figures 56-61 show other auxiliary blocks.

The auxiliary blocks, which are engaged with the top surface, can be called as top surface auxiliary blocks. They are commonly used in the top of the wall of the construction. There are usually two kinds of such auxiliary blocks. Figures 50-52 show the first type of top surface auxiliary block 23, the top surface thereof is on the same plane as that of the ridge of the block. Figures 53, 54 and 55 show the second type of top surface auxiliary block 24, which can be considered as a combination of the first type of top surface auxiliary block 23 with a block.

The auxiliary blocks, which are engaged with the bottom surface, can be called as bottom surface auxiliary blocks. They are commonly used in the bottom of the wall of the construction. There are usually two kinds of such auxiliary blocks. Figures 50-52 show the first type of bottom surface auxiliary block 25, the bottom surface thereof is on the same plane as that of the bottom foot of the block. Figures 53, 54 and 55 show the second type of bottom surface auxiliary block 26, which can be considered as a combination of the first type of bottom surface auxiliary block 25 with a block.

The auxiliary blocks, shown in figures 56 and 57, comprises three blocks, two of them longitudinally oppose to each other and joins, respectively, to both side of the other block. They are of cross shape, and can be used at the intersection between two,

three or four walls. In the auxiliary blocks of figure 56, one end surface of the two blocks is crossed with (on the same plane) both side surfaces of the other block. In the auxiliary blocks of figure 57, one end surface of the two blocks extends outwardly from the side surface of the other block.

The auxiliary blocks shown in figures 58-61 are formed integrality by joining the longitudinal portion of a block to the side portion of the other block. They are usually in the shape of "L" or "T" and used at the joint of two or three walls.

The auxiliary block shown in figures 58 is in the shape of L, one end surface of one of the two blocks intersects with one side portion of the other block. One end surface of the former block is on the same plane as one side surface of the latter block. The auxiliary block shown in figure 59 is based on the block shown in figure 58, wherein one end surface of one block extends outwardly from one side surface of the other block. This is an L-shaped auxiliary block.

The auxiliary blocks shown in figures 60 and 61 are in the shape of T. For the auxiliary blocks shown in figure 60, one end portion of one of the two blocks intersects with one side portion of the other block. One end surface of the former block is on the same plane as one side surface of the latter block. The auxiliary blocks shown in figure 61 is based on the block shown in figure 60, wherein one end surface of one block extends outwardly from one side surface of the other block.

The wall shown in figure 62 has the auxiliary blocks 23 and 25.

The wall shown in figure 63 has the auxiliary block 26, T-auxiliary blocks and a pillar with outward-extending blocks 27.

Figure 64 is a sectional view of the wall of Figure 62. There is an auxiliary block 25 at the bottommost position.

The wall shown in figure 65 has a projecting piece 28 on the top surface of the lower girder and a groove 29 on the bottom surface of the upper girder.

Figures 62 63, 64 and 65 show the walls formed by a plurality of blocks overlapped staggeringly. There are masonry joints or slots between the adjacent blocks. The top surfaces are engaged with the bottom surfaces to form the horizontal masonry joints. The end surfaces are engaged with each other to form the vertical masonry joints. The vertical masonry joints, which are vertically adjacent to each

other, are overlapped staggeringly. The left and right supporting slopes on the top surface of the underlying block are engaged with the bottom surface of the upper block, the left and right supporting slopes are used as a blocking or stopping structure and interlock the vertically adjacent blocks, and hence avoid relative horizontal movement.

The leak-proof mechanism of the masonry joints can be seen from figures 62-65. The arrows in figure 63 show the flowing water. If the water is to flow into the wall through the horizontal masonry joints between the blocks, then it will be blocked or stopped by the supporting slope, and thus obtaining the leak proof of the horizontal masonry joints. If the water is to flow into the wall through the horizontal masonry joints between the blocks, the space-time trajectory of the leak-proof is usually from high to low. The bottom foot of the uppermost block on the top of the vertical masonry joint is usually the peak of the leak-proof. The leaking water from the bottom foot of the uppermost block flows inwardly and downwardly. The projecting size of the ridge of the lowermost block in three blocks can cut off the space-time trajectory of the leak-proof. The water is stopped by the supporting slope of the lowermost block, incapable of flowing to the other side of the wall.

The size of the block is designed by referring to figure 63. See the mathematical model 1 and table 1, the total width of the block is 20cm, Sx=10cm. Suppose the total height of the block is H, the height of the shoulder is 10cm. When the mid ridge can just cut off the space-time trajectory, the critical projecting size from the upper bottom surface to the top of the ridge is h, H=10+h. Three are three blocks overlapped vertically. Suppose the width of the horizontal masonry joints is 0 in the dry masonry. Then, the distance between the bottom foot of the uppermost block and the top shoulder surface of the lowermost block is equal to the height of 10cm of the shoulder, h=10-Sy. When Sy<5. 6cm (that is, h>4. 4cm), the leak proof can be obtained in the 7^{th} grade wind. At this time, H>14. 4cm, Sy/H<5.6/14. 4=1/2.57. When Sy<4.7cm (that is h>5. 3cm), the leak proof can be obtained in the 8^{th} grade wind. At this time, H>15.3cm, Sy/H<4. 7/15. 3=1/3.25. That is to say, the block is shaped and sized such that when the three analogous blocks are overlapped vertically, the vertical distance Sy between the top of the ridge of the lowermost block and the bottom foot of the uppermost block is smaller than one third of the height H of the block, it is possible to obtain leak proof in the 7^{th} grade wind.

Similar to the above, when Sy<2.9cm (that is, h>7.1cm), leak proof can be

obtained in the 11^{th} grade wind. At this time, H>17. 1cm, Sy/H<2.9/17.1=1/5.9. That is to say, the vertical distance Sy is becoming smaller, the size h of the mid ridge which cut off the space-time trajectory is becoming lager, then the effect of leak-proof is also increased. When the vertical distance Sy<0, h>10cm, at this time, H>20cm and the Sy/H comes to be an infinitesimal, then the effect of leak proof in this case is the best. That is to say, the block is shaped and sized such that when the three analogous blocks are overlapped vertically, the ridge of the bottommost block is higher than the bottom foot of the uppermost block. For the wall thus formed, the water flowing from either side through the vertical masonry joints or the horizontal masonry joints can be blocked by the supporting slope, incapable of flowing to the other side.

For all of the blocks mentioned, based on the mathematical model and the calculation way of the leak proof and the non watertight and soil keeping, according to the principle of this invention, the space-time trajectory can be determined, and thus the size of the blocks can be determined.

With reference to figure 64, figures 39, 41, the mathematical model 1 and table 1, the vertical notches prolong the route Sx from the bottom feet to the ridge, the time of the horizontal flow of the water is extended, so the space-time trajectory of the leakage can be reduced when approaching the ridge. This is beneficial to the leak proof.

Seen from figure 62, when using the auxiliary blocks 23, 25 at the joint of the walls, the vertical slot shown by the thick lines in figure 62 will still make water leak. That is to say, the leak proof is not perfect.

Seen from the wall shown in figure 63, it can be found that the T-shaped auxiliary block solves the problem of the leak proof at the T-shaped intersection perfectly. Similarly, L-shaped auxiliary block solves the problem of the leak proof at the intersection between two walls perfectly. The cross-shaped auxiliary block solves the problem of the leak-proof at the intersections between two walls, three walls or four walls perfectly. Also, the use of the L-shaped auxiliary block, T-shaped auxiliary block and cross-shaped auxiliary block make the wall at the intersection and the adjacent wall to be connected integrally, thereby enhancing the integrality and the stability of the wall.

For the wall of figures 62, 63, when being bonded in the sticking masonry, the

bonding material of the wall can be provided throughout all of the masonry joints, or provided on the shoulders or the supporting slopes. Dry masonry is also available, no bonding material is needed in this case. If the supporting slopes are the wall of dry masonry, and the masonry joints between the slope and the downward-flared recess are air gaps, then it will further facilitate the drainage.

The pillar of the wall shown in figure 63 is provided with an outward-extending piece 27, which includes a top surface, a bottom surface and two end surfaces. The cross section of the outward-extending piece is substantially of a shape of downward-flared recess. The top surface of the outward-extending piece has a mid ridge higher than two sides of the surface so that the left supporting slope and the right supporting slope are formed. One of the end surfaces of the outward-extending piece is engaged with the pillar, and the other end surface of the outward-extending piece is engaged with the blocks. The top surface of the outward-extending piece is engaged with the bottom surface of the upper block. The bottom surface of the outward-extending piece is engaged with the top surface of the underlying block. A plurality of outward-extending pieces are arranged separately and orderly on the concrete pillar. A plurality of outward-extending pieces are engaged with the staggeringly overlapped blocks adjacent to the pillar. The pillar is engaged with the blocks by the outward-extending pieces. The left and right supporting slopes of the outward-extending pieces are used as a blocking or stopping structure and make the vertically adjacent blocks to be interlocked. It solves the problem of leak proof between the pillar and the block perfectly and enhances the integrality and the stability of the wall.

The shape of the outward-extending pieces corresponds to the blocks, the length thereof is usually less than the total length of the block. The pillar includes concrete pillar, concrete wall, steel pillar or other supporting pieces. For the concrete pillar of the frame construction, the outward-extending pieces are usually formed when pouring the concrete. If the pillar is a steel structure, then the outward-extending piece can be welded thereon. When mounting the outward-extending piece, sealing measures shall be provided between the pillar and the outward-extending piece, such as inserting a rubber, an ointment, glass cement or the like between the pillar and the outward-extending piece. The welding of leak proof can be considered as air-tight sealing.

In the wall shown in figure 65, a projecting piece 28 is provided on the top

surface of the girder at the lower portion of the wall. The lower surface of the projecting piece is hermetically engaged with the top surface of the girder. The projecting piece shall extend to the pillar at the nodal point of two adjacent beam/pillar, and engages hermetically with the pillar. The projecting piece is engaged with the downward-flared recess of the block when the block engages with the top surface of the girder. The section of the projecting piece is analogous to the section of the auxiliary block 25.

In the wall shown in figure 65, a groove 29 is provided on the bottom surface of the girder. The groove shall extend to the pillar at the nodal point of two adjacent beam/pillar. The groove is engaged with the top surface of the block, when the block engages with the bottom surface of the girder, the ridge of the block extends into the concave.

The arrangement of the projecting piece may refer to that of the outward-extending piece. The arrangements of the projecting piece and the groove can avoid the leakage at the joint between the block and the top surface or bottom surface of the girder, and make the joint or the interlock tight and reliable.

Figure 66 is an explanatory view of a wall shown in figure 63, which wall is effected by a lateral force. An auxiliary block 26 is provided on the base. When a lateral force is applied to the wall, the tendency of inclination of the upper block is interrupted by the ridge of the lower block. The tendency of movement shown by the thick line in figure 66 is limited by the ridge, and thus return to the stable state. Only if the lateral force is increased such that it can go beyond the limitation and break more blocks, the wall will be unstable. Therefore, the ability of antidumping and antiknock can be increased a lot.

In the wall shown in figure 67, the block shown in figure 5 is used to form a notch for putting a shelf thereinto.

The walls shown in figures 68, 69 are connected to an external frame by a connecting member 30. In the wall shown in figure 68, one end of the connecting member is arranged in the masonry joint. In the wall shown in figure 69, one end of the connecting member is arranged in a horizontal notch 17 of the block. The end, which is connected to the wall, of the connecting member is processed to be a shape engaged with the block, the other end of the connecting member connects with the

external frame in the way of hook, bolt and welding. The connecting member can be steel or aluminium, etc.

The block shown in figure 70 is a combination of a thin plate based on the block as shown in figure 3 and a shoulder. The shoulder can be provided on either or both sides of the thin plate. The material of the thin plate can be metal, plastics and other leak-proof materials. The thin plate of the block can produce the function of leak proof and interlock. The shoulder can bear the loads or weights. Thus, their functions are different. When the material of the thin plate is of radiation protection, it can be used in the construction of a radiation-proof wall. The thin plate has the same function of radiation protection just as that of the block shown in figure 32, 33.

The blocks shown in figure 71, 72 are hollow and used as molding blocks. The two end surfaces of the block shown in figure 71 are the same as those of the blocks shown in figure 9. One end surface of the block shown in figure 72 is the same as that of the block shown in figure 9, the top surface and the bottom surface at the other end of the block shown in figure 72 are flat surface. The molding block is usually used at the intersection between the walls for pouring a concrete pillar. The molding block is both equal to a structural form plate and combined with the wall formed by the blocks.

The wall shown in figure 73 includes the blocks, which are analogous to those shown in figure 34, 35 or 40. The walls adopt widen vertical masonry joints (slots) 32. At the holes and notches, flowers and grasses can be planted, thus forming vertical walls with greens.

The walls shown in figure 74, 75 are radiation-proof walls. The radiation-proof wall shown in figure 74 adopts the radiation-proof block shown in figure 33. The radiation-proof wall shown in figure 75 adopts the radiation-proof block shown in figure 33, and have the radiation-proof plates on the left and right supporting slopes, thus the function of radiation protection thereof is better than the wall of figure 74. When a radiation-proof wall is formed, the radiation-proof plates on the adjacent radiation-proof blocks are linked up in the longitudinal direction in a manner of end to end. If the radiation-proof plates is formed into the shape of the top surface of the block and is put in the masonry joints by referring to the above methods and principles, the radiation-proof walls can also be formed. The radiation-proof wall can also be constructed with the blocks which are produced by radiation-proof concrete

and other materials. The shape and the size of the radiation-proof blocks shall meet the following requirements. That is, when three analogous radiation-proof blocks are overlapped vertically, the ridge of the lowermost block is higher than the bottom foot of the uppermost block. In this case, the vertical masonry joint is not run through by a straight line, and thus having an ideal radiation-proof effect.

Figure 76 is a view of an anti-crack wall. The anti-crack wall is formed by the roughly anti-crack block of figure 7 with mortar. The anti-crack stripe on the top surface and bottom surface are unnecessary to be engaged with each other. Figure 77 is a partially enlarged view of the masonry joint of figure 76. It can be seen from the figure that the mortar between A and B, which enters into the roughness part of the block, the longitudinal shift of the block will be restricted as it is blocked by the mortar between A and B. Only when a lot of the mortar between A and B are broken, the block is possibly cracked. Therefore, the roughness can produce a good effect of anti-crack. Anti-crack mortar is proposed. Anti-crack mortar is a mortar mixed with one or more silk, thread, fiber and so on (such as flax thread, paper fibers and plastic thread, etc.). It has more stretching resistance and shearing strength than those of common mortar, and hence enhancing the anti-crack ability. If it is a dry masonry, the projection of the roughness can be put into the recess of the roughness. Also, the stripe of roughness has the restriction effect for mismatch crack.

The block of the wall shown in figure 78 is relative long. The cross section is analogous to the block shown in figure 4, and it has longitudinal holes. Outward-extending block is provided on the wall, the effect thereof is the same as that shown in figure 63.

Figure 79 shows a tunnel-liner wall, it adopts the block shown in figure 5 and figure 6. It has a connecting member and an isolation layer 33. The isolation layer is disposed between the wall and the rock-soil or structural body. The effect thereof is to form an air layer 34 between the isolation layer and the wall, the effect of the air layer is to build up a leakage circumstance shown in figure 63. The principle for leak-proof is the same as that shown in figure 62 and figure 63. For enhancing the strength of the liner of the tunnel, the wall can be connected to the rock and soil layer or structural body by the connecting member, which can be an anchor member and the like. Dry masonry tunnel-liner wall is flexible, it doesn't need to provide a distortion joint. Therefore, there is no problem of distortion joint, such as the aging of the watertight material, the crack and the like. Thus, it is favorable for simplifing the construction,

shortening the time limit for a project and reducing the fabrication cost.

Isolation layer shown in figure 80 is composed of several isolation sub-layer 35. The isolation sub-layer in the same layer is arranged in a manner of end to end. The isolation sub-layers in vertically layers are in lap joint, the upper layer overlaps the lower layer. The lower isolation sub-layer is interposed between the upper isolation sub-layer and the wall. The joint 36 between the upper isolation sub-layers is staggered with that between the lower isolation sub-layers. The effect will be better when isolation sub-layers in the joint are in a lap joint. The isolation sub-layer can be rag felt, plastic film, plastic plate, cloth, galvanized iron sheet and so on, and it doesn't need a sweating soldering. Thus, there are no technical problems such as omission and infirmity of fusion welding. Also, it is unnecessary that the isolation layer is watertight, the requirements on the sub-layer are low, the construction is simple and convenient. The methods for connecting the sub-layer and the wall are: isolation sub-layer is riveted onto the wall, or tie the sub-layer with iron wires onto the wall, or put the isolation sub-layer into the horizontal masonry joint when it is in masonry. The isolation layer can be provided in several layers.

Referring to the above principle, it can be seen from figure 80 that when the isolation sub-layer constituting the isolation layer is a leak-proof material, in the case of three isolation sub-layers, the top of the bottommost isolation sub-layer is higher than the bottom of the uppermost isolation sub-layer, the isolation layer has the optimal leak-proof effect.

The wall shown in figure 81 adopts the blocks with different width. The wide shoulder of the block is next to the structural body at one side of the wall. Air layer is formed between the wall and the structural body. The structural may be concrete wall or rock and soil, etc. The function of the air layer is the same as that of figure 79.

The walls that are shown in figure 79 and figure 81 can be used for constructions such as tunnel, underground, mine, laneway, underground civil air-defence work and underground storage, etc., it solves the leak-proof problem better, and make the interlock more stable.

The nine walls shown in figure 82 to figure 90 can be considered as retaining wall body, and they have helpful non-watertight and soil-keeping (soil-keeping) effects, and interlock stabilization. They can be applied to the constructions such as

soil keeping wall, embankment, barging bank, river bank, quay wall, slope protection, road embankment, sea embankment, cofferdam, earth and stone dam, jetty, projecting pier, lock dam, ground sills, sand dam, underground collecting reservoir and sewage disposal building, etc.

By referring to figure 62, figure 63, the non-watertight and soil-keeping effect of the retaining wall body shown in figure 82 to figure 90 are analyzed. When the masonry joint of the block is laid dry or provided with non-watertight passages that run through both sides of the wall, the muddy water in the soil enters into the horizontal and vertical masonry joints, it is blocked and thus raised by the supporting slope of the block. The space-time trajectory of the muddy water follows the rule from high to low. Only the water high than the mid ridge of the block can overflow to another side of the block. When the muddy water is in the process of becoming higher, the soil in water is deposited. The higher the mid ridge is, the better the spilling water effect is, and the better the soil-keeping effect is. The ideal non-watertight and soil-keeping effect is that the block is shaped and sized such that when three analogous blocks are overlapped vertically, the ridge of the bottommost block is higher than the bottom foot of the highest block. In this case, all of the muddy water entering into the vertical masonry joints are in overflowing non-watertight way.

For the retaining wall for non watertight as mentioned above, since each of the masonry joints becomes a passage of spilling water, the muddy water that reach everywhere of the wall is in the way of overflowing at adjacent places, with rapid drainage and reliable soil-keeping effects. Since the pressure of water in the soil body can be nearly neglected because of the rapid drainage, it substantially improves the capability of antidumping of the wall. Because of the reliable soil-keeping effect, the soil body behind the wall is in stabilization and is hard to flow out, and thus improving the capability of stabilization. Moreover, the staggered and interlocked blocks improve the entirety of the wall. Furthermore, from figure 66, it is known that the resistant function of the mid ridge improves the capability of antidumping of the non-watertight and soil-keeping wall.

The retaining wall can be in dry masonry or clay undersaturation masonry, the wall is flexible and adapted to the deformation such as sedimentation, dilation and so on. It is unnecessary to provide construction joint and movement joint, thus it is favorable for simplifying the construction, shortening the time limit for a project and reducing the fabrication cost.

The retaining wall shown in figure 82 is widened on the side adjacent the soil body. The soil acts on the wide shoulder of the block, and hence improving the capability of antidumping of the wall with the weight of the soil.

The retaining wall shown in figure 83 is an embankment wall, the flat surface of the bottom surface, which is adjacent to the water, of the block produces the effect of weakening the wave.

The wall shown in figure 84 adopts the block that is analogous to figure 5, the lateral connecting surface, which is adjacent to the water, of the block produces the effect of weakening the wave.

Thus, the structure of figure 85 can be considered as an earth-and-stone dam, the dam surface on the upstream can produce the non-watertight and soil-keeping effect. The inner side of the dam surface on the downstream can produce the non-watertight and soil-keeping effect, and the outer side is for leak proof. The wave wall is for wave protection. The leak-proof effect of the dam surface on the downstream can be used for flood discharge and drainage.

The wall shown in figure 85 can also be considered as an embankment, a roadbank, an underwater trestle and so on.

Figure 86 shows the wall of an underground collecting reservoir, since each of the masonry joints can be masonried as a dank passage, it leads to rapid collection of water. Since each of the dank passages can spill water and retaining soil reliably, thus substantially reducing the mud percentage of the water entering into the reservoir. Figure 86 can also be considered as a sectional view of the wall of a collection well.

Figure 87 shows the wall of a sand dam, the principle thereof is the same as that shown in figure 86. To enhance the capability of wall resisting flashing, the wall can be widened, or provide a blocking body at the downstream of the wall.

Figure 88 shows the wall of a garden-making cofferdam. It adopts the block shown in figure 14, the bottom foot toward outside of the cofferdam is relatively high, and the height of the supporting slope is relatively small, thus rendering a part of the water at the vertical masonry joints not to be blocked off by the supporting slope, and having not the process of overflowing. Thus, it is favorable for the rapid flowing of the muddy water into the weir.

If the retaining wall body is formed by using widened vertical masonry joints as shown in figure 73, it is favorable for the in-flow and out-flow of the water, and it can reduce the use of the block and has aethetic appearance. If the block shown in figure 34 or figure 35 or figure 40 is used with widened vertical masonry joints, the holes and notches can be used for planting flowers and grasses or for the habitation of aquatic animals.

The retaining wall body mentioned above can also be used for sewage treatment buildings, the principle thereof is the same as the non-watertight and soil-keeping principle. For example, if a sewage reservoir is built up with the blocks, the foul water will discharge from the masonry joints of the wall, the solid sewage in foul water is accumulated. If a sewage ditch is built up, the solid sewage will be blocked off before it flows into the inlet of sewer, the solid sewage in the sewage system will be reduced substantially, the inlet of sewer will not be jammed easily.

To improve the soil-keeping effect, the soil-retaining effect, and dirt-keeping effect of the wall, a filtering layer can be disposed at a side of the wall, the material of the filtering layer can be sand, geonet (earthwork net), screen and so on. The isolation layer shown in figure 79, figure 80 can also be used.

To improve the effect of keeping soil and keeping dirt, a filtering layer can be disposed in the masonry joints. Also, the filtering layer can be disposed between the adjacent isolation sub-layers, which can be lapped with each other.

To be leak-proof, non-watertight (pervious) or to improve the capability of anti-shock and stabilization of the wall, the ways shown in figure 63, figure 65, figure 69 can be adopted for the above walls. The ways shown in figure 89 and figure 90 can also be adopted.

The wall shown in figure 89 adopts a connecting member 30 to enhance the connection between the wall and the soil body. One end of the connecting member is fixed in the masonry joints or the openings of the block. The connecting member can be a metal or wood post, or steel wire and cords or the like.

Wall shown in figure 90 adopts a mesh member 37 to enhance the connection between the wall and the soil body. One end of mesh member is connected to the wall, and the other end is provided in the soil body. The ways connecting the mesh member with the wall are as follows. The mesh member is pressed into the masonry joints.

The mesh member is put on a bar member and a comb-shaped member, the bar member and the comb-shaped member is then arranged into the masonry joints. Blocks with holes or notches can be used, the bar member and the comb-shaped member with the mesh member is inserted into the holes and/or notches. The materials for the mesh member can be geonet, plastic net, mental net, mesh grid and so on.

For the elongated blocks of figure 91, there are flow-guiding projections on one end of the supporting slope and the ridge. For the elongated blocks of figure 92, there are flow-guiding projections on both ends of the supporting slope and the ridge. The flow-guiding projections produce the same effects as figure 30.

A block engaged with that of figure 91 is shown in figure 93. The top of the downward-flared recess is provided with an upward recess 38 to be engaged with the flow-guiding projections as shown in figure 92. This block is to be arranged above the block shown in figure 92, and it covers the vertical masonry joint between two blocks of figure 92. Figure 94 is a longitudinally sectional view of figure 92.

The walls shown in figure 95, 96, 97 are miter walls or oblique walls, the leak-proof principle is the same as the that shown in figure 63.

In the miter wall shown in figure 95, it has the block shown in figure 91 and thepillars with the outward-extending block, and hence has good leak-proof effect.

The miter wall shown in figure 96 is formed by staggeringly overlapping the elongated blocks. A vertical masonry joint is formed by the lapping of the ends of two blocks. The vertically adjacent vertical masonry joints are disposed in a stagger manner. The end of the block is supported on a supporting member.

The structural principle of the plate-type miter wall can be applied to the slope roofs. The pillars with the outward-extending blocks can be considered as roof beams. The elongated blocks can be considered as the roof boards. The staggered roof boards form a leak-proof slope roof. The vertical masonry joint is formed by lapping the ends of the two roof boards. The vertical adjacent joints are disposed in a stagger manner. The end of the roof board is supported on a supporting member, which is usually a wall body or a roof beam. The leak-proof principle is the same as that of figure 63.

Figure 97 is a view showing the top of the intersection between the two walls, or

the top of the liner wall of a tunnel, or a ridge of a house. The uppermost layer adopts the block shown in figure 93, the block shown in figure 92 is at the lower layer, the other blocks are analogous to figure 4. The block shown in figure 92 straddles and overrides on two walls. The block of the uppermost layer shown in figure 93 completely covers the vertical masonry joints between the blocks shown in figure 92. The slope roofs of this structure is used not only for leak proof and bearing weights, but also for constructing easily.

Figures 95, 96, 97 can be considered as the slope roofs, and there are usually structural layers on the slope roof, such as a leveling layer, an heat-insulating layer or a covering layer. It is proposed to provide an isolation layer between the roof board and the structural layer(s), the effect thereof is the same as that shown in figure 79 and figure 80.

A bridge deck structure is shown in figure 98. It adopts the block shown in figure 6. The blocks are laid sequentially and staggeringly from the bridge piers at two ends. The top surfaces and bottom surfaces of the adjacent blocks engage with each other by dry masonry or sticking masonry. Since the descending of the adjacent blocks are almost the same due to the inter-link therebetween , and the bridge deck is relatively smooth, and it is more safety and more steadily for the construction and the use.

A ground structure is shown in figure 99. It is formed by the blocks. When the blocks are laid, the lateral side or lateral connecting surface is put on the base of the ground. The top surfaces and the bottom surfaces of the adjacent blocks are staggered and interlocked with each other. When the base has a small pit or recess, the effect of integral interlock will not make the block above the pit descent separately. Therefore, the deformation of the ground is gentle, thus being beneficial to reduce the bumpiness of the vehicles. This block ground is especially suitable for the place where is usually maintained and changed, such as a goods yard for containers, a parking place for heavy duty vehicles, a bridgehead of a road, a sharp turn, or a crossroad and so on. It is also useful for a sharp turn of a road, a place necessary to slow the speed, an airport runway where is need to increase the resistance for sliding. By designing the width of the masonry joints and the differential heights of the blocks at both sides of the masonry joint, the masonry joint will produce an expected bumpiness when the vehicles roll over, thus reminding the driver of deceleration, and providing a resistance to the rolling motion of aero-tires.

For the blocks in the ground, the surface of one block is flat, and the surface of the other block is corrugated, or rough, or holed. Then the adjacent blocks cannot engage with each other completely. When rainwater penetrates into the masonry joints, the masonry joints below the mid ridge of the block can act as buffers. When a pedestrian steps thereon, the dirty water under the block of ground can not emerge from the buffers and splash onto the pedestrian.

If the traffic sign lines are provided by the ornamental blocks, it will be more durable than the paint sign lines. And the ornamental surfaces forming the bridge deck and the ground are ornamental.

The joints between the surfaces of the blocks for forming the bridge deck or ground, such as the joint between the lateral side surface and the top shoulder surface/bottom shoulder surface, angle steel can be used for wrapping the joints.

The molds for producing the block of this invention are shown in figure 100, figure 102 and figure 103.

Figure 100 shows a mold for producing a semi-finished product of bar shape. It usually has a large end and a small end, the large end is connect to the extruding machine for the block. The stock of the block, entering into the large end, will form a cored bar with the cross section of the block when coming out from the small end. Then the cored bar is cut into different length as required, and is finally fired.

An imprinting device 39 is provided outside the outlet of the cored-bar-type mold shown in figure 100. The imprint device should abut the cored bar.

An imprint wheel of the imprint device 39 is shown in figure 101. There are protruding codes on the surface of the imprint wheel. The imprint wheel abuts the cored bar and rotates with the extrusion of the cored bar. Thus, the characters and images of the protruding codes are printed onto the cored bar.

Another box-type mold is shown in figure 102. It comprises an upper mold, a mold box, and a lower mold. The flat lower mold forms an end surface of the block. The mold box can be divided into holes or cavities, each of which forms the top surface, the bottom surface and the lateral side surface or lateral connecting surface. There are mold cores on the upper mold, so that the other end surface of the block and the longitudinal hole in the block can be formed. The flat upper mold is used for

forming the other end surface of the block.

Another box-type mold is shown in figure 103. It comprises an upper mold, a mold box, and a lower mold. The lower mold is provided with concave-convex pieces for forming the top surface of the block. The mold box can be divided into holes or cavities, each of which forms the end surface and the lateral side surface or lateral connecting surface. There are other types of concave-convex pieces on the upper mold, so that the bottom surface of the block is formed. Other mold cores for forming vertical holes can be provided on the upper mold.

Although the invention has been described with reference to the embodiments and the drawings, it should be understood that various equivalent changes can be made by the skilled person in the art on the basis of the above disclosure. For example, the heights of the ridges is not equivalent in the longitudinal direction; the shape of this invention can be made with thin plate; a cross-shaped block can be made by combining with an bottom-surface auxiliary block; or the bricks, rocks, pre-cast products, metal pieces and the like having the features of the present inventions. Thus, the range of the protection of this invention should be defined by the claims attached.